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GB 2255489 A GB 2223927 A GB 1440182 A  
GB 1439184 A EP 0454268 A2 EP 0129346 A1

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(54) Abstract Title  
Fat/whey emulsion for production of reduced-fat cheese

(57) An additive for use in the manufacture of reduced-fat cheese comprises an aqueous mixture of a fat and whey protein concentrate treated to provide an emulsion. The fat is butter oil, heated to 60 degrees C and added to water containing whey protein concentrate (WPC) in powder form. The water may be distilled water or saline solution, and the WPC is up to 5% by weight of the butter oil. The mixture is blended and then homogenised to produce a creamy emulsion with fat droplets of less than one micrometer, coated with the whey proteins, which act as an emulsifier. The emulsion is then added to skimmed milk at a rate sufficient to provide a fat content of up to 50% by weight of the normal fat in milk, and this mixture is then used to make cheese.

GB 2 324 236

**A CHEESY COMESTIBLE AND A PROCESS OF MAKING SAME**

The invention relates to a cheesy comestible and a process of making same, and particularly to a reduced fat cheddar-type cheese.

As will be understood, cheese is a food made from the pressed curds of milk. Thus to prepare cheese, milk, usually from cows or goats (e.g. cows' milk for cheddar cheese) is curdled by adding an appropriate amount of rennet or lactic acid, which separates the milk into curd and whey. Curd is a thick creamy substance containing most of the protein and fat in the milk. Whey is a thin watery liquid. The whey is drained off, and the curd is usually salted, compressed into blocks, and allowed to harden and ripen. A hard cheese such as cheddar may usually be ripened by the action of bacteria added as a starter culture at or about the same time as the rennet.

In most procedures for manufacturing cheddar-type cheese with a fat content that is lower than normal, milk (the cheese-milk) is skimmed to reduce its fat content. The cheese is then used for cheesemaking as described above but is adjusted to increase the final moisture content. This compensates in part for the reduced fat content. The texture and flavour are however not typical of a full-fat cheese. Homogenisation, a process to break up fat droplets of milk into smaller particles that are evenly distributed through the liquid, has been used. Where cheese-milk with a reduced fat content has been subjected to homogenisation in an attempt to reduce the size of the fat droplets, the texture of the resulting cheese has been very fine but there can be problems of rancidity from the release of lipolytic enzymes (lipolysis) on disruption of the membrane surrounding the fat. However, the use of fat-replacers is not allowed under United Kingdom Cheese Regulations if the product is to be

called cheese as they are not composed of dairy ingredients.

It is accordingly an object of the invention to seek to mitigate these disadvantages.

According to a first aspect of the invention there is provided an additive for use in manufacture of a reduced fat cheesy comestible, comprising an aqueous mixture of fat and whey protein concentrate treated to provide an emulsion.

The aqueous constituent may comprise water, preferably distilled water. This provides a simple yet hygienic aqueous carrier, which may alternatively comprise a saline solution having a salt composition similar to that of milk.

The fat may comprise a butter oil. This provides a required source of fat which is itself a natural dairy product.

The whey protein concentrate may be in the range 3% - 7% by weight of the butter oil. This is a preferred range for a desired flavour, particularly when the whey protein concentrate may comprise up to about 5% by weight of the butter oil, preferably 5% by weight of the butter oil.

The fat droplets may have a mean diameter of not greater than 1 micrometer. This again provides an enhanced flavour, particularly when the fat droplets may have a mean diameter of less than 1 micrometer.

The fat content may be in the range 20% - 40% by weight of the additive, preferably approximately 31%.

According to a second aspect of the invention there is provided a process for

making an additive for use in manufacture of a reduced fat cheesy comestible, comprising the steps of providing a liquid fat, providing an aqueous carrier and providing a whey protein concentrate, and then emulsifying the mixture to provide a creamy additive product.

The step of providing the liquid fat may comprise providing a butter oil and melting it to about 60°C, though at a temperature which will not de-nature the whey proteins, which might otherwise affect their ability to emulsify the fat.

The step of providing an aqueous carrier may comprise providing distilled water. This provides a simple yet hygienic aqueous carrier, which may alternatively may comprise providing a saline solution having a salt composition comparable to that of cheese milk.

The step of providing a whey protein concentrate may comprise providing such a concentrate as a powder. This is a relatively simple way of combining the whey protein with the other constituents of the mixture.

The powder may comprise up to 5% by weight of the fat.

The process may provide the butter oil at about 60°C, may combine it at the same or similar temperature with the aqueous carrier and the whey protein concentrate, and then the combination may be emulsified.

The process may comprise providing the butter oil at about 60°C, providing the aqueous carrier at about 60°C, mixing the oil and aqueous carrier, providing the whey protein concentrate and adding it to the oil and aqueous carrier mixture, and then emulsifying the final mixture.

The emulsion may be provided by a mixing step and an emulsification step, and the emulsification step may be provided by the protein(s) in the whey protein concentrate. This provides an inherent final emulsification stage.

The fat droplets in the emulsion after the mixing step may have a mean diameter of not greater than one micrometer.

The oil droplets may have a mean diameter of less than one micrometer.

According to a third aspect of the invention there is provided a process for the production of a reduced fat cheesy comestible, comprising the steps of providing an additive as hereinbefore defined, providing an additive made by a process as hereinbefore defined, adding said additive to skimmed cheese-milk, and subjecting the mixture to a cheese making process.

The additive may be added to the skimmed cheese-milk at a rate sufficient to produce milk of up to 50% by weight of the normal weight of fat in milk.

The process may comprise mixing the mixture of additive and skimmed cheese-milk to provide an homogeneous mixture.

The mixture may be subjected to a subsequent homogenisation step.

According to a fourth aspect of the invention there is provided a reduced fat cheesy comestible, whenever produced using an additive as hereinbefore defined or by a process as hereinbefore defined.

An additive for use in manufacture of a cheesy comestible, a process for

making same, a process for making a cheesy comestible and a cheesy comestible embodying the invention are hereinafter described, by way of example with reference to the following Example.

An additive in the form of a cream is prepared by providing an oil in the form of butter oil melted at 60°C and adding to it an aqueous carrier and a whey protein concentrate (WPC). The aqueous carrier is in the preferred embodiment distilled water and it contains the WPC in the form of a powder, this mixture being added at 60°C to the melted butter oil. The WPC is up to 5% by weight of the fat (i.e. butter oil). The mixture of melted butter oil, distilled water and WPC is then blended, suitably in a high speed mixer or blender, to form a crude emulsion, the fat being dispersed more or less uniformly through the water and WPC mixture. The fat droplets in this emulsion are reduced in size to a mean diameter of less than one micrometer by passing through a valve homogeniser at a suitable pressure. During this process the whey proteins act as an emulsifier for the fat in the butter oil, to provide a stable emulsion. The whey proteins thus act as a chemical substance that coats the fat droplets so that they can remain dispersed throughout the water, forming the stable emulsion. There is thus a two stage emulsification process, the mixer stage and the protein emulsifier stage. The additive formed is a cream which contains only constituents that are found normally in dairy products so is itself to be considered as a natural dairy product. The fat content of the cream additive is approximately 31% by weight, but this may be varied as desired.

The reduction of the diameter of the fat globules to less than one micrometer compensates for the lower fat content by increasing the number of droplets of fat and therefore the number of weak points throughout the protein matrix

where fractures may start. This has the effect of compensating for the lack of fat and giving a texture on eating that is closer to that of full-fat cheese than the currently-produced version. In addition, the increased surface area of the fat droplets will help to develop a more normal flavour profile providing more interface between the fat and the protein where flavour-producing reactions take place.

The cream so produced is added to the skimmed milk at a rate sufficient to produce milk with up to half the normal amount of fat. It is mixed in to distribute it evenly.

It will be understood that the distilled water may be replaced by a saline solution having a composition comparable to that of milk. Also, in the process of making the creamy additive, the melted butter oil and distilled water (or saline solution) may be mixed, and the WPC powder may then be added.

The process may be summarised as the following seven steps:

1. Melt butter oil at 60°C
2. Add water
3. Add whey protein concentrate
4. First emulsification stage
5. Second emulsification stage
6. Add cream to skimmed milk
7. Make cheese

The texture of the cheese so made can be modified by using a suitable homogeniser to reduce further the size of the fat (oil) droplets.

**CLAIMS**

1. An additive for use in manufacture of a reduced fat cheesy comestible, comprising an aqueous mixture of a fat and whey protein concentrate treated to provide an emulsion.
2. An additive according to claim 1, the aqueous constituent comprising water.
3. An additive according to claim 2, the aqueous constituent comprising distilled water.
4. An additive according to claim 1, the aqueous constituent comprising a saline solution having a salt concentration similar to that of milk.
5. An additive according to any preceding claim, the fat comprising a butter oil.
6. An additive according to claim 5, the whey protein concentrate being in the range 3%-7% by weight of the butter oil.
7. An additive according to claim 6, the whey protein concentrate comprising up to about 5% by weight of the butter oil.
8. An additive according to claim 7, the whey protein concentrate



comprising 5% by weight of the butter oil.

9. An additive according to any of claims 6 to 8, the fat droplets of the emulsion having a mean diameter of not greater than 1 micrometer.
10. An additive according to claim 9, the fat droplets having a mean diameter of less than 1 micrometer.
11. An additive according to any preceding claim, the fat content being in the range 20% - 40% by weight of the additive.
12. An additive according to claim 11, the fat content being approximately 31%.
13. An additive for use in manufacture of a cheesy comestible, substantially as hereinbefore described in the Example.
14. A process for making an additive for use in manufacture of a reduced fat cheesy comestible, comprising the steps of providing a liquid fat, providing an aqueous carrier and providing a whey protein concentrate, and then emulsifying the mixture to provide a creamy additive product.
15. A process according to claim 14, the step of providing the liquid fat comprising providing a butter oil and melting it to about 60°C.
16. A process according to claim 14 or claim 15, the step of providing an aqueous carrier comprising providing distilled water.

17. A process according to claim 14 or claim 15, the step of providing an aqueous carrier comprising providing a saline solution having a salt composition comparable to that of cheese milk.

18. A process according to any of claims 14 to 17, the step of providing a whey protein concentrate comprising providing such a concentrate as a powder.

19. A process according to claim 18, the powder comprising up to 5% by weight of the fat.

20. A process according to any of claims 15 to 19, comprising providing the butter oil at about 60°C, combining it at the same or similar temperature with the aqueous carrier and the whey protein concentrate, and then emulsifying the combination.

21. A process according to any of claims 15 to 19, comprising providing the butter oil at about 60°C, providing the aqueous carrier at about 60°C, mixing the oil and aqueous carrier, providing the whey protein concentrate and adding it to the oil and aqueous carrier mixture, and then emulsifying the final mixture.

22. A process according to any of preceding claims 14 to 21, the emulsion being provided by a mixing step and an emulsification step.

23. A process according to claim 22, the emulsification step being provided by the protein(s) in the whey protein concentrate.

24. A process according to claim 22 or claim 23, the fat droplets in the emulsion after the mixing step having a mean diameter of not greater than one micrometer.
25. A process according to claim 24, the fat droplets having a mean diameter of less than one micrometer.
26. A process for making an additive for use in manufacture of a reduced fat cheesy comestible, substantially as hereinbefore described with reference to the Example.
27. A process for the production of a reduced fat cheesy comestible, comprising the steps of providing an additive according to any of claims 1 to 13, or an additive according to any of claims 14 to 26, adding said additive to skimmed cheese-milk, and subjecting the mixture to a cheese making process.
28. A process according to claim 27, comprising adding the additive to the skimmed cheese-milk at a rate sufficient to produce milk of up to 50% by weight of the normal weight of fat in milk.
29. A process according to claim 27 or claim 28, comprising mixing the mixture of additive and skimmed cheese-milk to provide an homogeneous mixture.
30. A process according to claim 29, comprising subjecting the mixture to a subsequent homogenisation step.
31. A process for the production of a reduced fat cheesy comestible,

substantially as hereinbefore described with reference to the Example.

32. A reduced fat cheesy comestible, whenever produced using an additive according to any of claims 1 to 14 or by a process according to any of claims 27 to 31.



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Claims searched: 1-32

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**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): A2B (BLP, BLF, BLX, BMD11, BADA)

Int Cl (Ed.6): A23C 19/05, 19/055, 21/06; A23L 1/307

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2255489 A (ST IVEL) See especially examples A1, B1	1,14,27 at least
X	GB 2223927 A (WATERFORD) See Page 8 line 21 - Page 9 line 7	1,14,27 at least
X	GB 1440182 A (UNILEVER) See Page 3 lines 10-17	1,14 at least
A	GB 1439184 A (STICHTING) See Ex I, III and Page 2 lines 56-61	
X	EP 0454268 A2 (FRIESLAND) See whole document, especially Examples 2, 4 and 6	1,14,27 at least
X	EP 0129346 A1 (LAND) See examples	1,14 at least

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than the filing date of this application.